UNIVERSITY OF GONDAR

COLLEGE OF MEDICINE AND HEALTH SCIENCE

INSTITUTE OF PUBLIC HEALTH

DEPARTMENT OF HUMAN NUTRITION

Prevalence and associated factors of anemia among adolescent girls living in Aw-Barrerefugee camp, Somali Regional state, Southeast Ethiopia

BY: Melaku Tadege

Advisors':

1. Molla Mesele (BSC.MSc)
2. Alemyehu Shimeka (BSc, MPH)

A thesis submitted to University of Gondar, College of Medicine and Health Science, Institute of Public Health, department of Human Nutrition for partial fulfillment of the requirements for masters of Science degree in Applied Human Nutrition

May, 2015

Gondar, Ethiopia

UNIVERSITY OF GONDAR

COLLEGE OF MEDICINE AND HEALTH SCIENCE

INSTITUTE OF PUBLIC HEALTH

DEPARTMENT OF HUMAN NUTRITION

Prevalence and associated factors of anemia among adolescent girls living in Aw-Barre refugee camp, Somali Regional state, Southeast Ethiopia

By: Melaku Tadege

Mobile: 0910120543

Email: meltad24@gmail.com

Approved by the Examining Board

_____

Director, Institute of Public Health

_____

Advisors' Name:	**Signature**
1. Molla Mesele (BSc, MSc)	_____
2. Alemayehu Shemeka (BSc, MPH)	_____

_____ _____

Examiners'

Acknowledgement

First, I would like to express my deepest gratitude to my advisors, Mr. Molla Mesele and Mr. Alemayehu Shimeka for their unreserved and tireless constructive comments and suggestions throughout my study from the commencing of the proposal to write up of this thesis paper.

I would like to thank University of Gondar, Institute of Public Health and Human Nutrition department for special coordination to develop this thesis.

My gratitude also goes back to all the data collectors, study participants and respective administration of refugee and returnee affairs of Ethiopia CEOs at each level for their support by providing equipment and materials, unreserved cooperation and encouragement during a data collection time.

I am also very thankful to Mr. Sennay Bahita (BSc, lab technician) for his strong support, valued comments and suggestions during training of data collectors and data collection.

I am also very grateful to thank all the staffs of Aw-Barre refugee camp health center especially Mr. Bizuayehu Kedir, Mr. Dini Ahmed, Mr. Abraham Yirgalem, Mr. Eshetu Getu, Mr. Abebaw Fanta, Mr. Belachew Amare, Million Asrat and Mr. Kibrom Beyene for their strong support in terms of idea, finance, encouragement and valued comments and suggestions when I was a coworker and throughout my study.

Finally, I am sincerely thanks to my families and friends for your strong psychosocial support throughout my study.

Acronyms/Abbreviation

AIDS	Acquired Immuno Deficiency Syndrome
ARRA	Administration of Refugee and Returnee Affairs
BMI	Body Mass Index
CDC	Communicable Diseases Control
DDS	Dietary Diversity Score
EDHS	Ethiopia Demographic and Health Survey
Hgb	Hemoglobin
HIV	Human Immunodeficiency Virus
SPSS	Statistical Package for Social Science
UNHCR	United Nation Higher Commission for Refugee
UNFPA	United Nation Fund of Population Agency
WFP	World Food Program
WHO	World Health Organization

Table of Contents

Contents

List of Tables

List of Figures

Abstract

Introduction: Adolescent girls in developing countries suffer from many social, economic and health problems. They are also vulnerable for both macro and micro nutrient deficiency including Anemia. Anemia is prevalent in these population because they have increased requirement, decreased intake and increased loss of hematopoietic nutrients. Deficiency of this nutrients is sever in adolescents living in refugee camps.

Objective: The objective of this study was to determine the prevalence and factors associated with anemia among adolescent girls aged 10 – 19 years in Aw Barre Somalia refugee camps, South East, Ethiopia, 2015.

Methods: A cross-sectional study design was employed. Study participants were recruited by using simple random sampling technique. Structured and pre-tested questionnaire were used for data collection. By prick a finger after applying aseptic technique and gently pressed the finger to take 10µl of blood on HemoCuvettes. The blood samples were tested by using HemoCue Hb 301 and the existence of anemia was established if hemoglobin level was <12.5gm/dl after adjustment altitude. EPI INFO version 7.0 was used for data entry and finally exported to SPPS version 20.0 for further analysis. Descriptive statistics were carried out then bivariable and multivariable logistic regressions were used to explore significant variables. Variables having P - Value ≤ 0.05 were considered as statistically significant.

Result: About 437 refugee adolescent girls were participating in this study with a response rate of 96.89%. The overall prevalence of anemic was 22%, 95%CI (17.6, 26.1). In this study, late adolescents were 2.05 (95% CI, (1.12, 3.73)) times at higher risk as compared to early adolescents and those who stay ≥ 8yrs in camp were 3.12 (95% CI, (1.16, 8.39)) times higher when related to those stay < 8yrs. Adolescent girls having inadequate intake of egg were 6.67 (95%CI, (1.15, 38.75)) times higher as compared to those who took frequently, this is similarly 12.66 (95%CI, (2.90, 55.27)) times among meat and meat products for development of anemia.

Conclusion: The prevalence of anemia among adolescent refugee girls is moderate public health problem. Education and awareness on adolescent nutrition and mobilization of small scale poultry farming activity in refugee camp is important for anemia prevention.

1. Introduction

1.1 Statement of the problem

Adolescence is the period between 10 and 19years of age which again classified as early (10-14yrs) and late (15 -19yrs) adolescents based on World Health Organization (WHO) [1]. It is a continuum of physical, cognitive, behavioral and psychosocial change that is characterized by increasing levels of individual autonomy, a growing sense of identity and self-esteem and progressive independence from adults [2, 3]. It is a period of physical growth, reproductive maturation, and cognitive transformations which may lead to high requirement of both macro and micronutrient [3-5].

Among the micronutrient deficiency anemia is one of the most common nutritional problems in many parts of the world, especially in developing countries where a majority of adolescents and displaced population located [6, 7]. Anemia during Adolescent, hemoglobin level less than 12mg/dl according to WHO [8], is a major public health problem in Ethiopia [9].

Anemia is a major public health problem in the general population of both developing and developed country, the problem is very high and serious in the refugee settings which needs intervention by using multiple micronutrient powered supplementation as a strategy in addition to treating underlying causes [6].

Adolescent girls are highly affected by anemia because of discrepancy between their increased iron requirements and decreased iron intake [10], due to rapid growth, menstrual loss, discrepancy between high iron need for hemoglobin (Hgb) formation and low intake of iron containing foods, erratic eating habits, dislike for foods which are rich in iron, like green leafy vegetables and Iron absorption inhibitors in food phytate /tannins [11] which is worth among food aid dependent refugee or displaced population [12].

The cause of anemia is multi-dimensional but in the context of refugee populations, the most important cause is inadequate dietary intake of micronutrients (especially iron, folic

acid, vitamin B12), and a lack of appropriate complementary foods given dependency on food aid [13, 14].

High rates of parasitic infection due to crowded refugee environments and poor access to water and sanitation leads adolescents at greater risk of anemia. High prevalence of malaria and HIV in adolescents at refugee camps make them more susceptible to anemia [15, 16].

1.2 Literature Review

1.2.1. Prevalence of Anemia among adolescent girls in refugee

The number of young people is increasing in the world and nearly half of the population in developing countries is under age 19 years [17].Based on 2008 WHO anemia database, the global prevalence of anemia for the general population is 24.8%. The global prevalence among non-pregnant women and pregnant women was 30.2 and 47.5% respectively. The highest prevalence of non-pregnant anemia is found in Africa (47.5%) and in South-East Asia (35.7%) that followed by the Eastern Mediterranean region 32.4%. Additionally, the global prevalence of anemia in school age children is 25.4%, in men 12.7% which tell us the burden of this problem is exist in adolescent as well [6].

A study in Nepalese refugee camp and a multi-center study in Australian for newly arriving refugee, the prevalence of anemia was 24% among Nepalese, while it was 16.4% among refuges aged < 30 years old who newly arrived in Australia [18, 19].

The prevalence of anemia among 15 – 49years old women refugee was 44.8% in Zaatari Syrian refugee camp in Jordan [20] and another similar study for those fled from turmoil in Iraq and were hosted at the eastern border of Jordan, 45% anemia prevalence was observed in the age of ≥ 10yrs old females [21].

Prevalence of anemia was 8.0% among 12–18 years aged adolescents in Karen Refugees of Australia [22]. Other similar cross-sectional surveys in Kakuma refugee camp in Kenya and seven other refugee camps in Nepal shows anemia prevalence were 46% and 29% respectively. During this survey, vitamin A deficiency was found in 15% and 30% of adolescents in Kenya and seven other camps in Nepal which suggest a mutual existence of these two micronutrients among adolescents refugee [23].

Based on the cross-sectional study in Fugnido refugee camp that located in Gambella, Southeast Ethiopia, Anemia among food aid beneficiaries' refugee adolescent aged10-19 years old was 62.9% which is a sever public health problem (≥ 40%) which is similar

with 6-59 months children (69.2%) but much quit higher than non-pregnant mothers (20 - 55years old) (14.2%) [14].

1.2.2. Factors affecting anemia among adolescent girls in refugee

Anemia may occur due to different micronutrient deficiency in human being which may related to age, gender and physiological need, infectious diseases, poor hygienic environment, low socioeconomic status and inadequate intake [24].

A study conducted in Australia for newly arriving Bhutan, Iran and Afghanistan refugee to determine Vitamin B_{12} level as a contributing factor for anemia, there was low level of B12 among < 14years old (11.5%) as compared to 15 -29years old (18.3%) The prevalence of anemia were 16.4%which is associated with low level of B12 but gender were not significant for B12 level [18]. Another survey were conducted to determine the nutritional status of Nepalese refugees aged 10-19years old by using anthropometry, hemoglobin measurement and vitamin A (serum retinol). Among the participants, 36% had low BMI, 24% were anemic and the overall prevalence of low retinol was 6% [19].

A cross–sectional study of anemia among non-refugee adolescent girls in rural area of Hassan district, South India shows a statistically significant association of anemia in relation to weight loss and low iron status but other factors like socioeconomic status, attainment of menarche, age group were not significantly associated with anemia. In relation to anemia and BMI, 60% were underweight, 38% were normal weight and 2% were overweight. The prevalence of anemia was 1% in post-menarche girls as compared to 29% in pre-menarche girls [25], but Nepalese adolescent refugee girls became anemic as age increase, having experienced of menarche and not related to BMI [19].

Survey to determine iron and vitamin A deficiency in long term refugees of North and East Africa bases on their dependency on international food aid among Kakuma (Kenya), Acholpii (Uganda), Tindouf (Algeria), Fugnido (Ethiopia) and Kebribeya (Ethiopia) refugee camps were affected by anemia that significantly associated with inadequate intake, malaria infection, age of the respondents in each camp, as comparison of the prevalence of anemia among age groups in Acholpii and Fugnido

camps that anemia wasa public health problem in adolescents and none pregnant women [26].

The hospital based case control study on returned travelers and immigrants/refugees in Australian by infectious diseases units for six years, the most common infections among refugee group were malaria, Tuberculosis, Schistosomiasis and helminthic infections had a significant contribution for anemia [27]. Similarly study in Sweden were done for resettled Eritrean refugees which shows existence of severe anemia and long symptoms duration due to Plasmodium Vivax malaria that reflect inadequate health care during migration [28].

A cross-sectional community based study which carried out in 3 schools in Jhaukhel, Nepal to determine the prevalence of anemia among female adolescents shows that 35.3% of them had anemia and highest portion of anemic girls were observed in those whose parental income low. Those girls attained menarche up to 13years were more likely to be anemic than those of above 13years of age group [29] which is opposite to Nepalese refugee.

The study in Kakuma and Nepal refugee camp shows higher association of post menarche which was55% and 37% respectively as compared to pre menarche (36% and 17%respectively) and also those who have low BMI, 48% and 22% respectively are more at risk of anemia in both camps (23).

Recommended dietary allowance (RDA) of iron for non-pregnant adolescent females based on their age 8 and 15mg/day for 10 – 13years and 14 – 18 years respectively and for pregnant adolescent is 23mg/day for 14 -18years old [30] but the amount iron that available from the monthly general ration totally is 31.8mg (21.3mg from wheat, 4.1mg from pulses and 6.4mg from vegetable oil) which is inadequate and Inadequate amount of iron in rations for fulfilling requirements in refuge leads to anemia due to increase demand at this age and its bioavailability may be affected by different factors [31].

1.2.3 Conceptual frame work

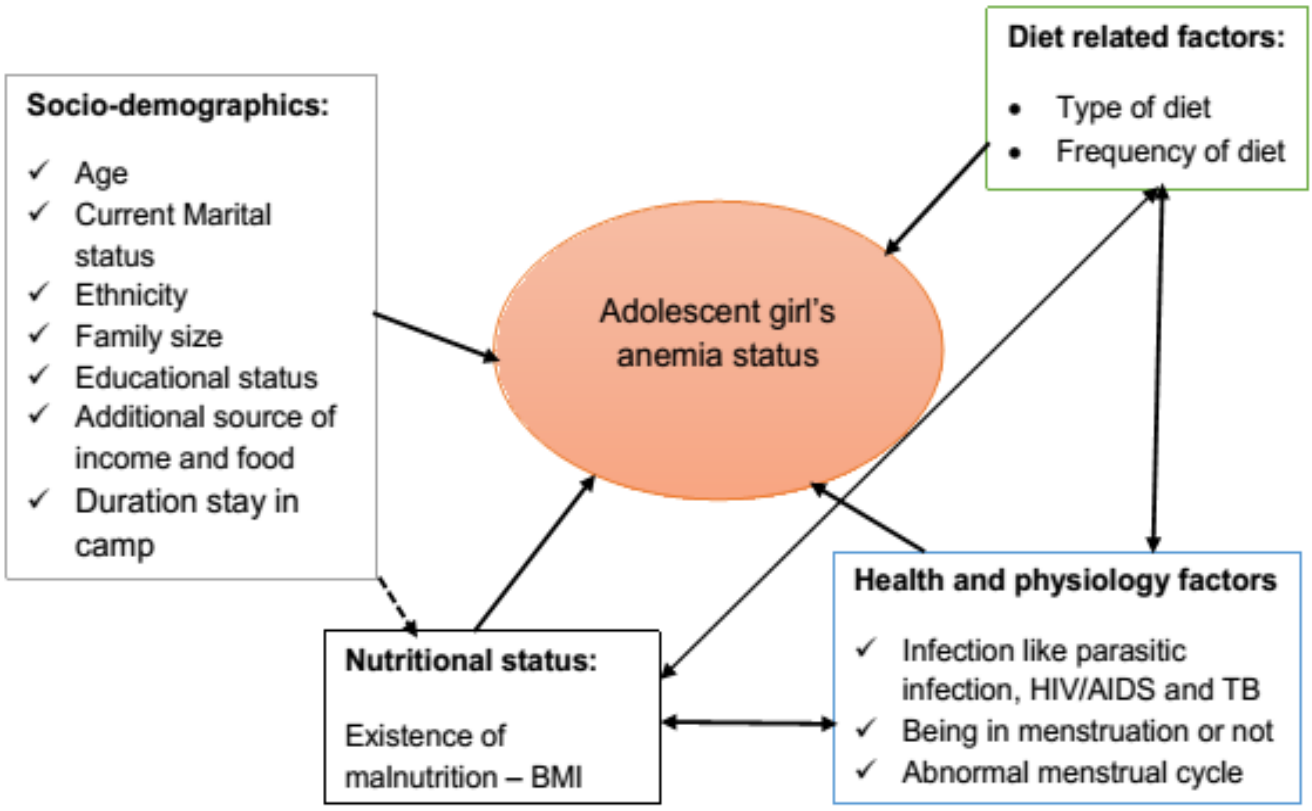


Figure 1: Diagrammatic presentation of conceptual frame work for factors affecting anemia among adolescent girls(source 12, 13, 15, 16, 23and 25)

1.3. Justification of the Study

Currently the number of refugee is increasing from time to time due to conflict and instability in their country. The number of refugee at 2008 that located in Ethiopia were 25,879 from Somalia, around 17,000 from Sudan and near 21,545 from Eritrea and in 2010 the number is drastically increase to 90,508, 25,623 and 44,924 respectively and those who are urban refugee (live in side Addis Ababa) in 2010 were 2595 with a total number of refugee at the end of 2010 in Ethiopia were 166,407 [31, 32]. Currently the number of the refugee found in Ethiopia increased from time to time and reaches to 689,107 according to 2015 UNCHR fact sheet.

People in a refugee camps are totally dependent in their general ration which contain 16kg wheat, 0.9kg of oil, 1.5 kg of Famix and 1.5kg of Pulse, 0.15 kg of Salt and 0.45kg sugar per person to maintain around 2100kc/day/person and the total amount micronutrient that found in the monthly general ration per person per dayare 31.8mg of iron, 354mg calcium, 386microgram of Vitamin A, and 301 microgram of Iodine [31]. This ration may not fulfill the iron requirements (31.8mg) which are needed to build RBC in adolescent girls. More over the prevalence and factors related to anemia in adolescent girls of refugee camps is not well known unlike the stable population.

Determining anemia prevalence and identifying determinant factors of anemia in this population will be important to plan intervention methods that may help to breaking the intergenerational effect on physical growth, cognition and productivity.

The finding of this survey might be a base line data for policy makers and international partners work on refuge population including WFP, UNHCR and other stake holders. Other researchers may also use the findings to further understand the causes of anemia in adolescents of refugee camps. Hence the present study will assess the prevalence and associated factors of anemia among adolescent girls living in Somalia refugee camps.

2. Objectives

2.1 General Objective

The aim of this study was to assess the prevalence and associated factors of anemia among adolescent girls aged 10–19 years living in Aw Barre refugee camps, Somalia regional state, Southeast Ethiopia, 2015.

2.2 Specific Objectives

- To determine prevalence of anemia among adolescent girls
- To identify factors associated with anemia among adolescent girls

3. Methods and Materials

3.1 Study design and period

Institution based cross sectional study design was conducted from March15 to April 15, 2015.

3.2 Study area

Aw Barre refugee camp is found under Eastern Somalia refugee camp coordination office and in Liben Zone of the regional state. It is located 678km far from the capital city of Ethiopia, Addis Ababa and 78km from the regional city of Somali, Jigjiga and 7km at the border of Somalia. It was established in July, 2007 by UNHCR and ARRA of Ethiopia. The camp is located at an altitude of 1621.84 meters (5321feets) above sea level[33]. According to the 2014 as of November ARRA report, the refugee camp have a total population of 12,803 and among this 5,500 and 7,382 were male and female respectively. There are a number of different clans or ethnic groups, major of them are Hawuyie, Barob, Shekhal, Bantu, Asharaf and others. Among the total population, the numbers of adolescent refugee girls (10- 19years of age) were 1318.

3.3 Source population

The source population of the study was all adolescent girls who live in Somali refugee camps.

3.4 Study population

The study population was adolescent girls in Aw Barre refugee camps

3.5 Inclusion and exclusion criteria

Inclusion criteria

All adolescent girls aged 10 – 19 years who were found in Aw Barre refugee camps Exclusion criteria

Those adolescent girls who were pregnant and lactating and were not registered as refugee/asylum seekers will be excluded from this study.

3.6 Sample size

Epi info 7 statcal was used tocalculatethe number of study participants by taking confidence level of 95% and marginal of error 4% for both prevalence and factors that associated with adolescent anemia:

Table 1: sample size determination for prevalence and factors associated with anemia among refugee adolescent girls, Aw-Barre, South East Ethiopia, 2015.

Prevalence and factors	P (%)	N	Remark
Anemia prevalence	69.2	369	
Low BMI	60.0	401	
Low house hold income	35.3	387	
Physiologic condition (post menarche)	55.0	410	Selected
Being late adolescent	18.3	285	

Where:

- ♥ n - is the number of adolescent girls
- ♥ p - is proportion of anemia

Among all ‘n’s, the highest number was taken as the total sample size of the study subjects for both prevalence and factors associated with anemia which was 410. The final sample size were**451**adolescent girls, after adding 10% non-response rate.

3.7 Sampling procedure

Aw Barre refugee camp was selected by lottery method from Sheder and Kebirebeya refugee camps. There were a total of 1318 adolescent girls aged 10-19 years in Aw Barre. Simple random sampling was applied to select adolescents in this camp.

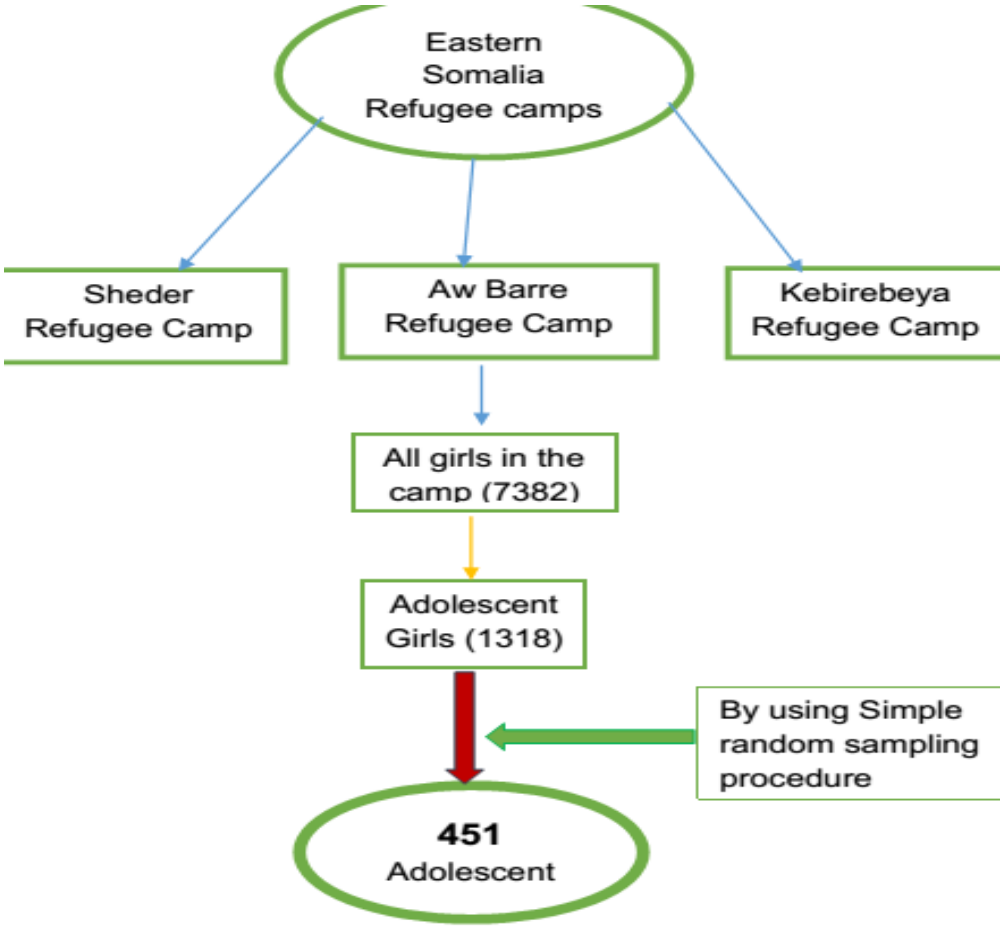


Figure 2: Schematic presentation of sampling procedure to select the study participants of adolescent girls

3.8 Data collection method and equipment

Modified and pretested UNHCR standardized expanded nutrition survey (SENS) questionnaire were used to collect the data, and it had socio-demographic characteristics, health and physiology, hemoglobin and nutritional status, diet frequency and type, additional food and income source (beyond general ration). This questionnaire were had both open ended and close ended questions.

The English version questionnaire had been translated to Somali version and were retranslated back to English to check its consistencies.

The data collectors were nurses and medical laboratory technician with two supervisors. A two days training about the basic skills of measuring Hemoglobin and calibration of

instruments, interview, ways of obtaining the written consent or assent and other precautions like how to interact with respondents was given for data collectors and supervisors.

Before starting data collection, always there was checking of materials and equipment's like weight scale with height stand, HemoCuvettes, HemoCue Hb 301 machine, and sanitary materials like cotton, alcohol and glove.

Finger prick blood was drawn after wiping the finger by alcohol socked cotton for hygiene and safety measures, then the pricked finger was gently pressed to got a sample near to 10µl blood and then it had been put on HemoCuvettes, and inserted into the HemoCue Hb 301 then finally the hemoglobin level was read and recorded. Weights and heightswere measured using a weight scale with height stand machineby placing the participants in to Frankfurt position, then the result was recorded to the nearest 0.1kg and 0.1cm respectively.

3.9 Data quality assurance

Pretest was done outside of the study area (Sheder refugee camp)on 20 samples before data collection.

The weight scale had been calibrated by using 1kg standard weight at each morning, height measurements was checked with other meter taps and the HemoCue Hb 301 machine will be calibrated with the 3 calibrating Hemo –solutions (Eurotol Hb 301 control solution which is bovine based solution) and pricing and taking a sample blood when the weep finger was dry, avoiding of squeezing the finger and complete filling and avoiding air bubbles during filling of HemoCuvettes.

As a measure of data quality assurance communication between the data collectors, supervisors and the investigator were held on daily basis to discuss on the problems faced and the progress of the data collection process.

The collected data were checked for completeness and consistency by the supervisors and investigator during and after data collection.

A definition of concepts and terms had been done clearly with Somali language to avoid ambiguity. The supervisors were recruited outside of the refugee health center workers to avoid familiarization (information bias) with respondents.

The data was managed by editing, verification coding, classification and tabulation of collected data during data entry and analysis.

3.10 Study variables

3.10.1 Dependent variable

- ❖ Anemia status (Yes/No)

3.10.2 Independent variables

Socio-demographic factors

- ✓ Age
- ✓ Current marital status
- ✓ Ethnicity
- ✓ Family size
- ✓ Educational status
- ✓ Duration stay in camp

Health and physiology related factors

- ✓ History of current and known infection like parasitic infection, HIV/AIDS and TB, diarrhea
- ✓ Being onmenstruation or not
- ✓ Abnormal menstrual cycle

Diet related factors

- ✓ Type of diet
- ✓ Dietary diversity score
- ✓ Meal frequency

Nutritional status

- ✓ Existence of protein energy malnutrition – low BMI for Age

Existence of other Income and food sources

- ✓ Additional monthly family income (beside general ration)
- ✓ Other food sources

3.11 Operational definition

Anemia in adolescent: when the adolescent girl have a hemoglobin level below 12 mg/dl as cut-off levels and it is classified as mild (11-11.9 g/dl), moderate (8.0-10.9g/dl) and sever(lower than 8.0g/dl) [8]. Since the altitude of the camp is >1000m above sea level, adjustment of Hgb cut off value (+0.5g/dl) is important [34].

Poor nutritional status: adolescent girls having BMI < 18.5kg/m^2 were considered as having poor nutritional status. Those having BMI ≤ 16 kg/m^2 were considered as sever, 16 – 17 kg/m^2 as moderate and 17 -18.4 kg/m^2 as mild chronic energy deficiency.

Abnormal Menstruation: if the girl reports having a virginal bleeding two or more times within month, the amount of blood is higher when she compare with previous and having recent history of abortion or miscarriage.

Stunting: Adolescents with height for age below -2 Z scores from the median value of WHO reference data will be considered as stunted**.**

Thinness/ wasting: - Adolescent girls with <−2SD of BMI-for-age Z score will be considered as thinness/wasting.

Dietary diversity score: is a qualitative measure of food consumption that reflects household access to a variety of foods which is categorized as low dietary diversity (≤ 3 food groups), medium dietary diversity (4 and 5 food groups) and high dietary diversity (≥ 6 food groups).

3.12 Data processing and analysis

The collected data were checked for completeness then compiled, coded and finally entered to Epi info 7 and was exported to SPSS version 20 software for analysis.

The finding of the study has been presented by using text, tables and graphs. Descriptive analysis was carried out to describe the variables and analytical analysis were carried out to sawthe crude and adjusted effect of each variable. Binary logistic regression model was used to assess the independent effects of each independent variable towards the anemia status.

Also those variables were fitted in to a multivariable logistic regression model to identify the independent contribution of each variable for the anemia status of the adolescents. Variables were found statistically significant at a p-value of <0.05 in multivariable logistic regression models and 95% confidence intervals had been used at this stage and Enter and Back ward LR methods of variable selection was applied to assess the independent effect and to see the multivariable effect of each independent variable.

The Hosmer-Lemshow goodnessoffit test was performed on the logistic model for motivation, to assess how good the model constructed was (P-value = 0.19).

3.13 Dissemination of the result

The finding has been submitted to Institute of public health of university of Gondar, ARRA and UNHCR offices so that these body use the information to make scientifically justified decision and intervention. Also the research resulthas been presented for refugee camp stakeholders and will be published in journals.

3.14 Ethical consideration

Ethical clearance was obtained from the Institutional Review Board of University of Gondar College of Medicine and Health Science, institute of public health. An official letter was also obtained from administration of refugee and returnee affairs of Ethiopia and letters were prepared for the local authority of the selected refugee camp. Written informed consent and or assent were obtained from each study participant after they were included to this study. The purpose of the study were explained to them. Lastly,

they had got information about the rights to interrupt the interview at any time and to refuse giving a blood sample.They were assured that the sampled blood were used to measure the Hgb level in front of the study participants and after measuring and recording, that was immediately discarded in to disposal safety box. Confidentiality were maintained at all levels of the study. Adolescent girls that were anemic were referred to the refugee health center by using internal referral slip of the refugee health center.

4. Result

4.1. **Socio-demographic characteristics of respondents:**

From the total sample size, 437 adolescent girls were participated in the study with a response rate of 96.90%. The mean age of participants was 13.96 yearswith a standard deviation (SD) of 2.70 years and 60% of them were found between the ages of 10 to 14 years. One fourth of participants were from Hawuyie clans and followed by Bantu (17.8%). Half of the households in the camp had a family size of 5-9 persons. The majority 407 (93.1%) of the respondents had been stayed in the camp above seven years(**Table 2**).

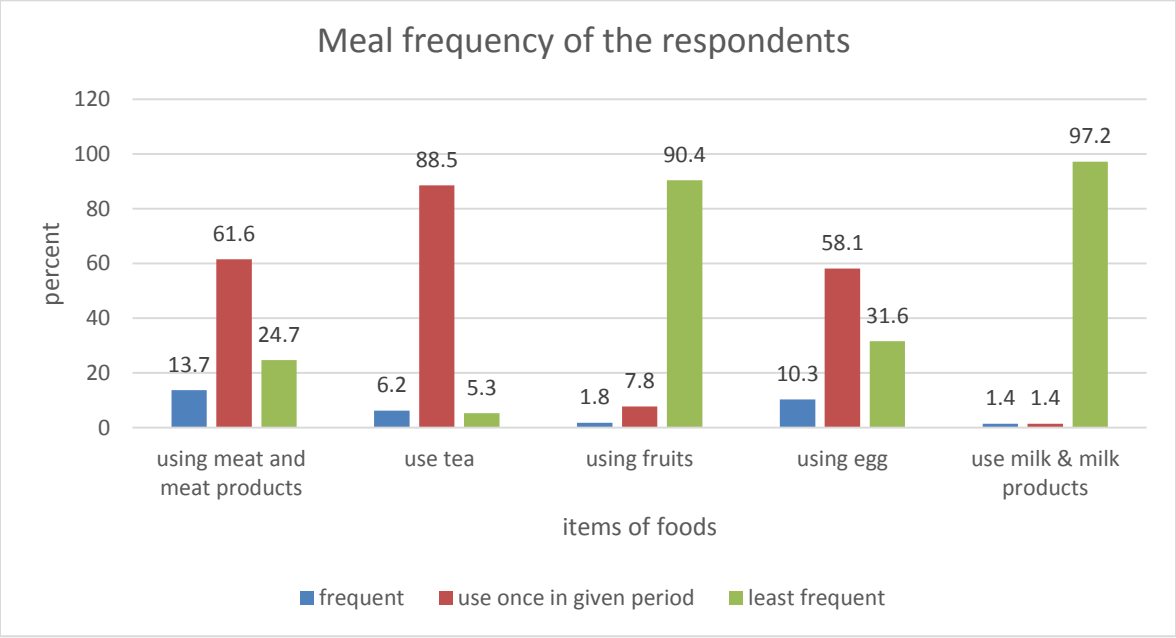
Table 2: Socio-demographic characteristics of respondents recruited from Aw-Barre Somalia refugee camp, South East Ethiopia, 2015.

Variables	Number	Percentage (%)
Age (N= 437)		
10 – 14	262	60.0
15 – 19	175	40.0
Additional Monthly income (N= 437)		
Yes	02	0.5
No	435	99.5
Marital status (N= 437)		
Single	414	94.7
Married	23	5.3
Ethnicity (N= 437)		
Hawuyie	111	25.4
Asharafa	40	9.2
Bantu	78	17.8
Dir	49	11.2
Darod	29	6.6
*Other	130	29.8
Family size (N= 437)		
1 – 4	31	7.1
5 – 9	231	52.9
10 –19	175	40.0
Educational status (N= 437)		
Unable to read and write	45	10.3
Able to read and write	17	3.9
primary school (1 - 8)	327	74.8
Secondary school (9 - 12)	46	10.5
Collage and above	2	0.5
Domestic animals (N= 437)		
Yes	14	3.2
No	423	96.8
Selling of food aid items (N= 437)		
Yes	428	97.9
No	9	2.1

*Others ethnicity: Gore, Gaboye/Maddagan, Areb, Shikal, Tumal, Samaran, Isak, Barbo, Rahawayan, Shanshi, Geladi, Moreshe, Jalele and Durukbo

4.2 **Meal frequency**

Most of the respondent had a meal two times in a day 410(93.8%), three times were 18 (4.1%) and others 9(2.0%). The chance to eat fruits like orange, banana, papaya etc. among them were less than once per month 395(90.4%) and the majority of them were had a chance to use meat and meat products, egg and milk and milk products were within at least in month were 269 (61.6%), use at list once within a month were 254(58.1%) and less than within a week 425(97.2%) respectively. Most of the respondents mostly use tea during eating were 405(92.7%) their meal that followed by after meal and before meal were 29(6.6%), 3(0.7%) respectively. Use of food items frequency is shown below as meat and meat products usage as (use frequently within 2 weeks, use some times in month and may not use within a month), tea use (more than twice per day, once per day and sometimes within a week), using fruits (more frequently within a week, sometimes in a month and may not use in a month), using egg (use frequently within 2 weeks, use some times in month and may not use within a month) and for use of milk & milk products (more frequently within weeks, use some times in a week and may not use within a week) in figure below (**Figure 3**).



** Fruits like Orange, banana, papaya, lemon etc.

Figure 3: meal related characteristics of respondents recruited from Aw Barre Somalia refugee camps, Southeast Ethiopia, 2015.

4.3 **Dietary diversity**

From the total of 437 respondents, all of them were use rice, spaghetti and macaroni as a staple diet of the family437 (100%). The major source of food intake items of the respondents were general ration that distributed by ARRA that donated from WFP and exchange or selling of these food items 428 (97.9%) but 9 (2.1%) didn't sell the distributed item. Among those who had sold, all of them were selling the Wheat was 428 (100%) to buy other food staffs most of the time.

Among the respondents, 294 (67.3%) of them were had good diversity score (≥ 6 food items) that followed by 122 (27.9%) and 21(4.8%) of medium and poor food diversity score respectively by using 12 food item diversity score of FANTA project within 24 hours. But, the variability of the foods in each category of item was very low throughout since their major source of food income has been general ration.

4.4 **Health and physiology conditions**

Respondents did not reported any known chronic diseases. From all respondents, 256(56.8%) of them had experienced their menarche at the mean age of 13.96years, and among these adolescent girls only 5(0.5%) of them were had abnormal menstruation cycle (**Table3**).

Table 3: Health and physiology related characteristics of respondents recruited from Aw-Barre Somalia refugee camp, Southeast Ethiopia, 2015.

Variables	Frequency	Percent (%)
Having diarrhea (437)		
Yes	1	0.2
No	436	99.8
Being on menstruation (437)		
Yes	256	58.6
No	181	41.4
Condition of Menstruation (256)		
Normal	251	98.0
Abnormal	5	2.0

4.5 **Nutritional status and hemoglobin level**

Anthropometric measurement such as weight, height and hemoglobin level were used to determine the nutritional status of all respondents. The mean weight ± SD of respondents was 43.39kg ± 11.00kg), the mean height ± SD was 152.35cm ± 9.59cm and the mean hemoglobin ± SD was 13.47g/dl ± 1.50g/dl.

By considering BMI as a measure of nutritional status, the average of their BMI were 18.47kg/m^2 with a standard deviation of 3.58kg/m^2. Based on WHO BIM classification, 114(26.1%), 59(13.5%) and 70(16.0%) were had sever, moderate and mild malnutrition. Also there isrisk of overweight and obesity which is 16(3.7%) and 4(0.9%) respectively.

As compared to WHO growth reference curve of heightforage, 0.9% of them was< -3SD and 7.1% was < -2SD at a mean ± SD of -0.45 ±1.12, were severely and moderately stunted respectively. The wasting rate by using their BMI for age, 1.6% < -3SD, 12.1% < -2SD, 9.8% < +1SD, 1.8% < +2SD, 0.2% < +3SD at a mean ± SD of -0.52 ± 1.21.

Since altitude is a factor to determine the hemoglobin level of individuals, adjustment was done at the cut of value of the hemoglobin level. The altitude of Aw-Barre refugee camp is 1621.84m above sea level (>1000m), so the hemoglobin cut of value is adjusted by adding 0.5g/dl[34].From all respondents, 96(22.0%, 95% CI (17.6, 26.1))were anemicby taking the hemoglobin cut off value of 12.5g/dl after adjustment and classified as severely, moderately and mildly anemic based on WHO standard cut off point (**Figure 4**).

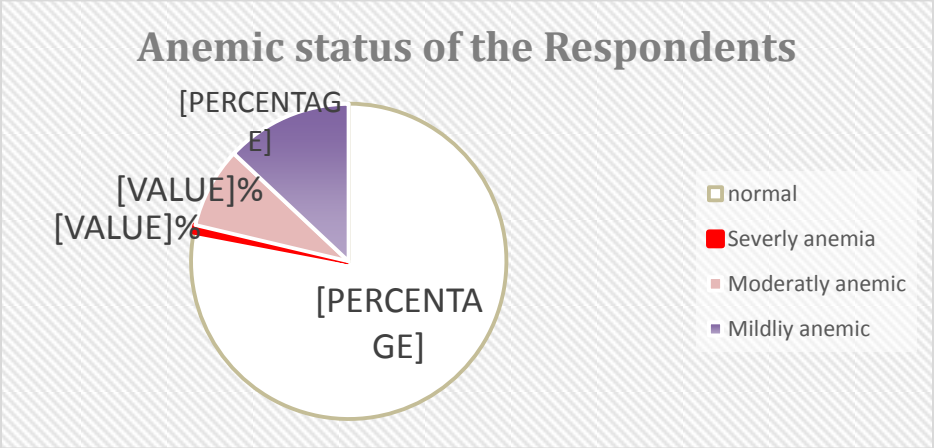


Figure 4: Anemic status of adolescent refugee girls recruited from Aw-Barre Somalia refugee camp, Southeast Ethiopia, 2015.

4.6 **Associated factors of anemia**

A crude analysis was done to assess existence of any association between the independent variables and anemia of the adolescent refugee girls. In binary logistic regression;age, family size, duration stayed in the camp, current marital status, frequency of eating meat and meat products and frequency of eating egg were found to be positively associated variables with anemic status of adolescent girls.

After fitting these significant variables in to multiple logistic regression, age, length of duration stayed in camp, intake of egg meat and meat products were independently associated with anemia. Late adolescentswere 2.05 times more likely to had anemia as compare to early adolescents(AOR: 2.05, 95%CI (1.12, 3.73). Those who had a higher length of time in camp were 3.12 times more likely to had anemia than those who were stay short duration (AOR: 3.12, 95%CI (1.16, 8.39)).

The odds of developing anemia among those who ate meat and meat products (Heme iron food sources) less than one per monthwere 12.66 times higher as compared to those who ate within weeks (AOR: 12.66, 95% CI (2.90, 55.27)), similarly it was 6.67 times higher among less than once per month egg user as compared to those who ate within 2 weeks (AOR: 6.67, 95% CI (1.15, 38.75)) as shown in the following table (**Table 4**).

Table 4: Results of binary and multiple logistic regression analysis ofanemia status among adolescent refugee girls of Aw-Barre Somalia refugee camp, South East Ethiopia, 2015.

Variables		Anemia		Crude OR (95% CI)	Adjusted OR (95% CI)
		Yes	No		
Age (yrs.)	10 to 14	52	210	1	1
	15 to 19	44	131	*1.36(0.86, 2.14)	**2.05 (1.12, 3.73)
Current marital status	Single	88	326	1	1
	Married	8	15	*1.98 (0.81, 4.81)	.78 (0.20, 2.97)
Educational status	Unable to read and write	13	32	1	1
	Able to read and write	5	12	1.03(0.30, 3.50)	0.63 (0.11, 3.43)
	Primary school (1 - 8)	71	256	0.68(0.34, 1.37)	0.65 (0.25, 1.67)
	Secondary school (9 -12)	6	40	0.37(0.13, 1.08)	0.37 (0.10, 1.42)
	Collage & above	1	1	2.46(0.14, 42.38)	1.64 (0.01, 212.98)
Family size (median = 9)	Below the median	37	175	1	1
	≥ median	59	166	*1.68(1.06, 2.67)	1.50 (0.82, 2.76)
Duration stayin the camp (median = 8)	Below the median	6	68	1	1
	≥ median	90	273	*3.74(1.57, 8.90)	**3.12(1.16, 8.39)
Having domestic animal	Yes	2	12	1	1
	No	94	329	1.71 (0.38, 7.79	2.08 (0.30, 14.44)
Selling of food aid items	Yes	94	334	0.95 (0.20, 4.82)	1.41 (0.15, 13.41)
	No	2	7	1	1
Frequency of using meat & meat products	use within 2 weeks	3	57	1	1
	use sometimes in a month	24	245	1.86(0.54, 6.40)	1.37(0.33, 5.61)
	Almost may not use within a month	69	39	*33.61 (9.87, 114.5)	**12.66(2.90, 55.27)
Frequency of egg	use within 2 weeks	2	43	1	1
	use sometimes in a month	23	231	2.14 (0.49, 9.41)	2.34(0.42, 13.08)
	Almost may not use within a month	71	67	*22.78(5.31, 97.77)	**6.67(1.15, 38.75)
Milk and milk products usage in within a week	Use frequently	1	5	1	1
	Use sometimes	2	4	2.50(0.16, 38.60)	10.67 (0.37, 311.50)
	Less or may not use at all	93	332	1.40(0.16, 12.14)	4.53 (0.34, 60.04)
Fruits use	frequently within a week	2	6	1	1
	some times in a month	9	25	1.08(0.18, 6.36)	1.81 (0.20, 16.36)
	Almost may not use within a month	85	310	0.82(.16, 4.15)	0.92 (0.13, 6.32)

Frequency of tea use	More than 2 times in a day	5	22	0.82 (0.20, 3.28)	0.21 (0.04, 1.17)
	Use once in a day	86	301	1.03 (0.37, 2.85)	.41 (.12, 1.43)
	Use some times in a week	5	18	1	1
DDS	≤ 3 foods items	6	15	*1.70 (0.63, 4.58)	1.93(0.50, 7.45)
	4 – 5 food items	34	88	1.64 (1.01, 2.68)	1.80(0.95, 3.40)
	≥ 6 food items	56	238	1	1
Attaining menarche	Yes	52	204	0.79(0.50, 1.25)	0.58 (0.25, 1.33)
	No	44	137	1	1
BMI	< 18.5Kg/m^2	56	187	1.15 (0.73, 1.82)	0.85 (0.40, 1.80)
	≥ 18.5Kg/m^2	40	154	1	1

* shows statistically significant at α = 0.2, * *shows statistically significant at α = 0.05, 1 = reference group

- Use frequently – use these food items at least ≥ 2 times within a week
- Sometimes – use at least once in a week or may not frequent like those use frequently users
- May not at use at all - those who take these foods rarely or not at all within a month and these are not a part of their feeding habit
- DDS were used by using 12 food items

5. Discussion

In the adolescence stage, iron need is increased due to rapid growth and onset of menstruation in girls, Irregular eating habits and the lower consumption of animal source foods contributes to the development of anemia. Therefore, girls have higher incidence of anemia[24].

This study shows that the prevalence of anemia among adolescent refugee girls were 22%, 95% CI (17.6, 26.1). According to WHO classification, it is a moderate public health problem.This finding of this study is very low when compare with the findings of the study (62.9% - sever public health problem) in Fugnido refugee camp (Ethiopia) [14].This might be due to difference in sample size, refugees in Fugnido camp were stay longer than Aw-Bare refugee camps and study populations with dissimilarlocal circumstances.

The prevalence of anemia in this study is low due to the absence of infectious and communicable diseases but in Kakuma refugee camp (Kenya) the prevalence was 46% due to high rate of infectious and communicable diseases[23].This might related tohigh burden of infectious diseases due to demography variation amongadolescent with inadequate health care coverage in refugee setting.

The overall low Hgb results showed variation of anemic status by age, duration stay in the camp, eating of egg and meat and peat products.

Late adolescents weremore significantly affected by anemia in this study. The odds of developing anemia was 2.05 times higher than with compared to early adolescents (10 – 14yrs) (AOR:2.05, 95% CI (1.12, 3.73). This finding is similar with a study done on Nepal[19]. However, age wasnot significant associated with anemia in the study done at a stable population of Hassan district of India[25]. As the result it indicates older girls are more risk because of adolescent growth spurt and mensuration which is also consistent with possibility of rapid growth in stature, muscle mass and fat mass during adolescence results in greater daily requirement for iron and other micro nutrients.

The duration of stay in the camp were also one of the significant variable that increase the development of anemia in adolescent girls. Those adolescents stayed ≥ 8yrs were3.12times more likely to develop anemia than those who had a duration below < 8yrs (AOR: 3.12, 95% CI (1.16, 8.39). This finding is supported by a similar study in Ethiopia among long terms of North and East Africa bases on their dependency of international general food aid[13, 14]. This might be due to the fact that as age increase the requirement increase and the stored micronutrient became depleted, also not replaced by what they were eat, the chance to involve in work is high and may lead to greater demand of energy.

Having anemia among less likely uses egg within a month were 6.67 (AOR: 6.67, 95%CI (1.15, 38.75)) times higher as compared to frequent users and those less likely uses meat and meat products within a month were 12.66 (AOR: 12.66, 95%CI (2.90, 55.27)times at higher risk as compared to those who use frequently.This finding is in agreement with a survey on refugees of North and East Africa bases at Kakuma (Kenya), Acholpii (Uganda), Tindouf (Algeria), Fugnido (Ethiopia) and Kebribeya (Ethiopia) which anemia was associated with inadequate intake iron rich foods[13]. This might be due to general rationdependency among refugee which led to have a limited dietary supply of micronutrients, unable to meet their demand,lacks Heme iron (meat and egg) food source and potential enhancers for micronutrient absorption.

The study was limited in linking anemia to specific micronutrient deficiency,unable to establish any possible causal link to the specific micronutrients deficiency as well as to know the specific food groups which favor this anemic condition. The study also not consider to identify the type of anemia and clinical assessment of anemia.

6. Conclusions

The prevalence of anemia among adolescent refugee girls is moderate public health problem,and small proportion of the adolescent girls had severe anemia.

The result showed that factors like age, length of stay in camp, low frequency use of egg and meat and meat products were found to be strong predictors for the development of anemia.

7. Recommendation

Based on the findings of the study, the following points recommended to help in improving adolescent girl health in relation to anemia:

For UNCHR/WFP/ARRA

- It is important to consider a small scale poultry and vegetables gardening in order to enhance iron reach food intake in the house hold by taking the best practices of this activity in Somali region on a small land and securing initial found for them.
- The need of ongoing practice of conducting annual surveys among food aid beneficiaries of adolescent girls at leastby using anthropometric and Hgb indicators.

For sub offices of UNCHR/WFP/ARRA at zonal level

- ✓ Emphasis should be given on adolescent health during planning on prevention, controlling and treatment of anima like other reproductive programs

For Health center medical doctors of the refugee camp

- The nutrition and health education targeting on adolescent health with focus of anemia prevention and control.

For researchers

- Further research has to be done by biochemical methods with clinical assessment to identify the specific micronutrient deficiency.

8. Reference

1. WHO, *Young People's Health. A Challenge for Society, WHO Technical Report* 1986, WHO: Geneva, Switzerland
2. Mitchell, K., *Adolescent sexual and reproductive health a tool kit for humanitarian setting, A Companion to the Inter-Agency Field Manual on Reproductive Health in Humanitarian Settings.* Save the children and UNFPA, 2009.
3. WHO, *Physical status: the use and interpretation of anthropometrey*, in *WHO technical reports 854*. 1995, World health organization: Geneva. p. 263 - 274.
4. Whitney, E. and Rolfes, R.S., *Understanding Nutrition*. 11 ed. 2008, USA: ThomsonWadsworth. 575 - 577.
5. Mann, J., Truswell, S., *Essentials of Human Nutrition*. 2 ed. 2002, New York: Oxford University Press Inc. 536 - 539.
6. WHO, *Worldwide prevalence of anemia 1993–2005 WHO Global Database on Anaemia.* 2008.
7. UNHCR, *UNHCR Strategic Plan for Anaemia Prevention, Control and Reduction, Reducing the Global Burden of Anaemia in Refugee Populations 2008 - 2010.* 2008.
8. World Health Organisation, *Nutritional anemia: report of a WHO Scientific Group Geneva*. 1968, World Health Organisation: Switzerland.
9. CSA, *Ethiopia Demographic and Health Survey 2011* 2012: p. 173 - 187.
10. Kaur, S., Deshmukh, P., and Garg, B.S., *Epidemiological correlates of nutritional anaemia in adolescent girls of rural Wardha.* Indian J Community Med, 2006. **31**: p. 255-58.
11. Kishore, J., *National Health Programs of India*. 2006, Century Publications: New Delhi. p. 82 -84.
12. Weise Prinzo, Z. and de Benoist, B., *Meeting the challenges of micronutrient deficiencies in emergency-affected populations.* Proceedings of the Nutrition Society, 2002. **61**(2): p. 251 –7.
13. Seal, A.J., Creeke, P.I., Mirghani, Z., et al., *Iron and vitamin A deficiency in long-term African refugees.* J.Nutr. , 2005 **135:**: p. 808-813.
14. Haider J, *Common micronutrient deficiencies among food aid beneficiaries: Evidence from refugees in Ethiopia.* Ethiop J Health Dev., 2011. **25**(3).
15. Osungbade O K. and Oladunjoye O A., *Anaemia in Developing Countries: Burden and Prospects of Prevention and Control Anemia*, ed. Silverberg D. 2012: InTech.
16. Hassan K, Sullivan M. K., Yip R., et al., *Factors Associated with Anemia in Refugee Children, community health and nutrition.* J. Nutr. , 1997. **127**: p. 2194–2198.
17. *State of world population, 2014* in *THE POWER OF1.8 billion ADOLESCENTS, YOUTH AND THE TRANSFORMATION OF THE FUTURE* Osotimehin, B., Editor. 2014, UNFPA: New york. p. 13 - 20.
18. Benson, J., Phillips, C., Kay, M., et al., *Low vitamin B12 levels among newly-arrived refugees from Bhutan, Iran and Afghanistan: a multicentre Australian study.* PLoS One, 2013. **8**(2): p. e57998.
19. *Nutritional Assessment of Adolescent Refugees —Nepal, 1999.* MMWR Morb Mortal Wkly Rep, 2000. **49**(38): p. 864 - 7.

20. Bilukha, O.O., Jayasekaran, D., Burton, A., et al., *Nutritional status of women and child refugees from Syria-Jordan, April-May 2014.* MMWR Morb Mortal Wkly Rep, 2014. **63**(29): p. 638-9.
21. Khatib, I.M., Samrah, S.M., and Zghol, F.M., *Nutritional interventions in refugee camps on Jordan's eastern border: assessment of status of vulnerable groups.* East Mediterr Health J, 2010. **16**(2): p. 187-93.
22. Paxton, G.A., Sangster, K.J., Maxwell, E.L., et al., *Post-arrival health screening in Karen refugees in Australia.* PLoS One, 2012. **7**(5): p. e38194.
23. Woodruff, B.A., Blanck, H.M., Slutsker, L., et al., *Anaemia, iron status and vitamin A deficiency among adolescent refugees in Kenya and Nepal.* Public Health Nutr, 2006. **9**(1): p. 26-34.
24. WHO/UNICEF/UNU, *Iron Deficiency Anaemia Assessment, Prevention, and Control A guide for programme managers*. 2001, Who: Geneva. p. 17 - 21.
25. Siddharam, S.M., Venketesh, G.M., and Thejeshwari, H.L., *A Study of Anemia Among Adolescent Girls in Rural Area of Hassan district, Karnataka, South India.* Int J Biol Med Res, 2011. **2**(4): p. 922 - 924.
26. Seal A. J, Creeke P. I, Mirghani Z, et al., *Iron and vitamin A deficiency in long-term African refugees.* J.Nutr. , 2005 **135:**: p. 808-813.
27. O'Brien, D.P., Leder, K., Matchett, E., et al., *Illness in returned travelers and immigrants/refugees: the 6-year experience of two Australian infectious diseases units.* J Travel Med, 2006. **13**(3): p. 145-52.
28. Sonden, K., Castro, E., Tornnberg, L., et al., *High incidence of Plasmodium vivax malaria in newly arrived Eritrean refugees in Sweden since May 2014.* Euro Surveill, 2014. **19**(35).
29. Gupta, R.K., Ghimire, H.P., and Panta, P.P., *Study of anemia in adolescents female and effect information, education and communication in rural area of central Kathmandu Valley.* Nepal Med Coll J, 2013. **15**(2): p. 129-32.
30. *Dietary reference intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc*. 2001, Institute of Medicine, Washington D.C.: National Academy Press.
31. WFP/UNHCR/ARRA, *ETHIOPIA 2010 JOINT ASSESSMENT MISSION (JAM)* 2010. p. 23.
32. WFP/UNHCR/ARRA, *ETHIOPIA 2008 JOINT ASSESSMENT MISSION (JAM).* 2008: p. 6.
33. Rage, I.A., *based on experience in conducting nutrition surveys in Rwanda* UNHCR Regional Support Hub Nairobi, 2012.
34. WHO, *Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System.* Geneva, World Health Organization, 2011. **WHO/NMH/NHD/MNM/11.1**.

9. Annexes

Annex 1: information Sheet (English)

Title of research project: prevalence and factors associated with anemia among adolescent Somalia refugee girls in Aw Barre refugee camp, Southeast Ethiopia, 2015

Name of the principal Investigator: MelakuTadege

Name of Advisors: 1**.** Mr.MollaMesele (MSc, MSc)

2. Mr. AlemayehuShimeka (BSc, MPH)

Name of the organization: University of Gondar Institute of Public Health department of Human Nutrition

Introduction

Anemia is asignificant public health problem especially for growing children and adolescents. Its prevention is important because of its association with brain development in early years of life and affects the later life in different ways. Improving the quality of dietary intake would help fight malnutrition and micronutrient deficiencies.

It is for this reason that we intend to check the iron status of you/your girl to confirm the presence or absence of anemia in with others of the same age inthis location.

Purpose of the study:

Information gained from this study will be used by decision makers in making good decisions for the promotion and improvement good health and the nutritional status of adolescent girls in this refugee community and for the other at large.

Procedures

We select you based on a sampling technique to be participant of the study. Data collectors will ask you some questions base on questionnaires''about your socio-demographic, nutritional and heath related questions and take a measurement.

Duration of the study

If you are agreeing to participate in the study, the survey will take about 30 minutes for both questionnaires' and to take the hemoglobin, height and weight.

Risks/ discomforts

There is no risk to you to be in the study and there may be a little discomfort during performing a finger prick to get a sample of blood and there may be disrupting your normal discomfort,

Benefit: your/your child participation in this research may/may not directly provide you a certain benefit as an individual. It may benefit all adolescent girls those who are in this situation in future including you/your child.

The right to with draw from the study:

If you are not willing to participate in the study, you have the right to withdraw from the research study at any time. By not participating in the study you will not be penalized and you will not loss anything.

Confidentiality

Any records relating to you and your child will be strictly confidential. Your names and those of your child will not be used in any reports from the study.

The right of compensation

During participating in the study there is no any compensation that will refund for your time that we take during interviewing and taking measurement.

Consent

If you grant a consent for us, the information from you and the laboratory examination for you/your adolescent girls will be done by a medical personnel. This will help us to assess the hemoglobin status of girl. Blood collection from you/your child will be used only for the tests explained to you and is going to be done in your presence. No blood is going to be carried away for further tests. The results of the test will be given to you immediately and the sample will be discarded in to safety box after reading the Hgb level.

Voluntariness

You do not need to participate in the study if you do not want to.

Privacy

The data collection will be held in your personal compound or home to keep your personal information secret and the collected data will be not shared for any one and will be discarded after the data is used for this intended purpose safely.

Persons to contact

If you want to talk to someone about this study, if you feel you have not been treated properly, if you are hurt by joining the study, if you have any question, you can contact:

Principal investigator: **MelakuTadege** Cell phone number: **+251- 910 12 05 43**

or

Advisors at Institute of public health collage of Medicine and health science, University of Gondar:

Advisor(S)

Name	**Cell phone number**
1. MollaMesele (BSc, MSc)	+251 – 920 25 46 64
2. AlemayehuShimeka (BSc, MPH)	+251 – 912 13 75 86

If you have understood the document and you have been given the chance to ask any questions now or do you agree to be in this study, may I continue? 1. Yes 2. No

Annex 2: Consent form (English)
Greeting:

My name is _____ (data collector's name), I am here to collect information from you about adolescent girl's related issue and taking a blood sample (near to 10µl) to determine the level of your Hgb.

If you grant us consent, we will do a laboratory examination for you/your adolescent girls which will be done by medical personnel. This will help us to assess the hemoglobin status of girl. Blood collection from you/your child will be used only for the tests explained to you and is going to be done in your presence. No blood is going to be carried away for further tests. The results of the test will be given to you immediately.

Personal agreement statement (18 and 19yrs old)

I, the undersigned bellow, have understood the above information, which has been fully explained to me by the data collector. I agree to take part in this study.

Participant's signature _____ Date _____

Personal and Parent agreement statement (10 - 17yrs)

If you agree to be in the study, please sign below to show that this research study has been explained to you and that you agree to take part**.**

_____ _____

Participant Signature Date

Parents

I consent my child to participate in this research activity and to give a blood sample and in my judgment, my child is voluntarily and knowingly agreeing to participate in this research study.

Parent's signature _____ Date _____

Annex 3: Questionnaire (English)

Description	**Identification**
Hosting country	Ethiopia
Region	Somali
Name of refugee camp	Aw Barre Somalia Refugee camp
Zone	
Block/	
House number /code	
Interviewer name	
Supervisor name	
Date	

5 General Information on Socio-demographic

Before you start answering to the questions, I would like to know a bit more about 'You or your child'

Code	Questions	Response	Skip to
Q101	Age of the study participants	_____ years	
Q102	Your current marital status	1. Single 2. Married 3. Divorced 4. Widowed 5. Other (specify) ----------	
Q103	What is your Ethnicity	1. Hawuyii 2. Barbo 3. Asharaf 4. Bantu 5. Others (Specify) ----------	
Q104	Educational status	1. Unable to read and write 2. Able to read and write 3. Primary school (1 – 8) 4. Secondary school (9 – 12) 5. College and above	
Q105	What is the family size	_____	
Q106	How long have you been in this camp? In years or months	_____	
Q107	Is their additional monthly income	1. Yes 2. No	If 'No' skip to

			Q110
Q108	If “yes’ for question Q107, How much?	___ ETB	
Q109	Which of the following is the source	1. Formal/Informal work 2. Remittance 3. Own Business 4. Gift 5. Other (specify) ----------	
Q110	Did your family have any animal?	1. Yes 2. No	
Q111	If ‘yes’ for the above question (Q110), Which one and how many of the following animals do your family currently own?	1. Goats _____ 2. Camel _____ 3. chicken and hens ____ 4. others (specify with numbers) --------- , -------	
Q112	Did you/your family exchange or sell any of the commodities your family received as food aid	1. Yes 2. No	If No, skip to Q201
Q113	If yes for the above Q112, what did you/your family sell/exchange?	1. Cereals 2. Pulses 3. Oil 4. Sugar 5. Other (specify) ---------	
Q114	If yes for above question Q112, why did you/your family trade or sell them? Circle all the answers given	1. To obtain other/preferred food stuffs 2. To obtain cash to buy animals 3. To obtain cash for food for animals 4. Other _____	

6 **Meal frequency**

Code	Questions	Response	Skip to
Q201	How many times do you eat	1. More than 3 times 2. Three times	

	per day?	3. Two times 4. One times	
Q202	How frequent do you eat meat and meat products	1. Once a week 2. Twice a week 3. More than twice a week 4. Once per month 5. Less than one times per month	
Q203	Did you drink tea?	1. Yes 2. No	If 'No' skip to Q206
Q204	When did you drink Tea?	1. Before meal 2. After meal	
Q205	How frequently do you use tea?	1. More than 2 times a day 2. Once per day 3. Once per week 4. More than once per week 5. Less than once per week	
Q206	How frequently do you use fruits like Orange, Papaya, Mango and Banana?	1. Once a week 2. Twice a week 3. More than twice per week 4. Once per month 5. Less than one time per month	
Q207	How frequently do you use egg	1. Every day 2. Once a week 3. Twice a week 4. More than twice per week 5. Once per month 6. Less than one time per month	
Q208	How frequently do you use Milk and milk products	1. More than once a day 2. Once a day 3. Once per week 4. Less than per week	
Q209	What is the staple diet in the family?	1. Rice and spaghetti 2. Maize and sorghum 3. Others specify _____	

7 **Dietary Diversity or Food intake history**

Code	Food group [used by 24 recall]	Examples	YES=1 NO=0	source: 1. purchase 2. gift 3. other (specify)
Q301	Cereals	Millet, sorghum, maize, rice, or other grains (beside general ration)		
Q302	Vegetables	Pumpkin, carrots, squash, sweet potatoes, green pepper, tomato		
Q303	Fruits	Orange, papaya, mango banana		
Q304	Organ meat (iron-rich)	liver, kidney, heart or other organ meats or blood -based foods		
Q305	flesh meats	Beef, lamb, goat, chicken …		
Q306	Eggs			
Q307	fish and sea foods			
Q308	legumes, nuts and seeds	beans, peas, lentils, nuts, seeds or foods made from these		
Q309	milk and milk products	milk, cheese, yogurt or other milk products		
Q310	oils and fats	oil, fats or butter added to food or used for cooking		
Q311	Sweets	sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies		`
Q312	Spices, Condiments, Beverages	sauces, coffee, tea, beverage		`

8 **Health and physiology conditions**

Code	Questions	Response	Skip to
Q401	Did you/your child have any known chronic diseases?	1. Yes 2. No	If No skip to Q404
Q402	If your answer is yes for the above question (Q401), can you mention it?	_____	
Q403	If “yes” for the above question (401), show me or tell me the name of the medication?	_____	
Q404	Did you have any repeated diarrhea for these 2 weeks?	1. Yes 2. No	If No skip to Q406
Q405	If yes for Q404, did you/your child go to clinic for help and the cause was told by your clinician?	1. Yes 2. No 3. if yes (specify)____	
Q406	Did you/sheattain menstruation?	1. Yes 2. No	
Q407	If your Answer is yes for the above question (Q406), is it normal or abnormal?	1. Normal 2. Abnormal	

9 **Hemoglobin Level and nutritional status**

Code	Measurements and questions	Record result	Remark
Q501	Weight (nearest 0.5kg)		
Q502	Height (nearest 0.1cm)		
Q503	Hgb(mg/dl)		
Q504	BMI		
Q505	Does A girls needs referral?	1. Yes 2. No	
Q506	Are you currently taking iron with folic supplements?	1. Yes 2. No	
Q507	Are you currently taking Vitamin A supplements in capsules	1. Yes 2. No	

This is the end of our interview, thank you for your co-operation!

Annex 4: Information sheet (Somali version)

Foomka: waxayalan sabab tauu cudurka anemia (dhiig yaranta) ee 10-19sano oo ku nool ee xuranta qoytriga xaruta Aw Baree camp, Somaliee Ityobya, 2015.

Baadhaha: MelakuTadege

La taliyayaasha: Molla Mesele iyo Alemayehu Shemeka

Ururka/xafiiska: Jaamacada Gondar, Qaybta Caafimaadkka

Kharash: Jaamacada Gondar

Qaybta I: Warqada warbixinta

Maga cyadanadu waa: _____ iyo _____ waxaan cilimibaadhis ku samaynaynaa haweenka uurka leh. Waxaan rabnna inaan kuu sharaxno waxa ay cilmi baadhistani tahay, marka intaadan goaansanin ka qaybgalka cilmibaadhistan cidii aad rabato waad tala wayddiin kartaa ood la hadli kartaa.

Inta aan sharaxaada kuguda jirno haddiii ay jiraan waxaadan fahmin fadlan I waydii.

Haddii ay jiraan suaala kugu soo dhaca xilli kale oo aad rabto inaad na wayidiiso nagala soo xidhiidh tefefanka lambarkiisu yahay: 0910120543

Ujeedada cilmi baadhista

Cilmi baadhista waxaa loogu talgalay in lagu ogaado in **hooyooinkauurk**a leh ay dhiig laaan yihiin iyo inkale, iyo sababah ay ku timaado dhiig laaantu. Dhiig laaantu waa cudur halis oo dhibatto iyo dhimashaba ku keena hooyada iyo ilmahacaloosha ku jiraba haddaba haddii aan ogaano in hooyooyinka uurkah leh ay dhiig laaantu ku badantahay cilmibaadhistan waxay sahli in masuuliyiintu qorsheeyaan siddi loo dawayn lahaa islamarkassna looga hortagi lahaa.

Nooca cilmibaadhista iyo talaaboyinka la marayo

Cilmi baadhitsan waxaa ka qaybgalaya haweenka uurka leh oo kaliya sida adiga oo kale, haddii aad ogalaato inaad kaqayb qaadato cilmi baadhista waxaa lagaa tijaabin dhiig laaan waxaana ku waydiinaynaa suaalo ku saabsan nafsad ahaantaada iyo

qoyskaagaba, waxaan kaa qaadaynaa dhig farta halmar. Waxaan cabiraynaa gacantaad sare (jinta) si aan ogaano inay nafaqo daro ku hayso iyo inkale, si aan saas u samayno waxaan u baahanahay 40 daqiiqo inaad na siiso.

Ka qaybgalku qasab ma'aha (waa tabaruc)

Inaad kaqayb gasho cilmibaadhitsan waxay ku xidhantahay rabitaankaaga. Adaa kala dooran innad ka qaybgasho iyo inkale, haddii aad ka qaybgasho iyo haddii aad diido waa isku mid oo adiga wax dhib ah kuu keeni mayso. Haddii aad maka hore yeesho markaan dhaxda socono waa ddiidi kartaa ood ka noqon kartaa goaankiigii hore.

Iiaalinta sirta

Cilmibaadhistan waxaanu kaaga baadhaynaa dhig laaan waxaana ku waydiinaynaa suaalo ku saabsan adiga iyo gurigaaga. Warbixinta aan kaa helo cidna u sheegi mayno oo aan adiga kaahayn.

Faa,iidooyinka cilmibaadhista

Ka qaybgalka aad ka qaybqaadatay cilmibaadhistan ma jirto wax faa,iido ah o oaad sigaar ah uga helayso, waxay faaiido u leedahay dhamaan hooyooyinka uurka leh ee Soomaaliyeed. Haddii aad dhiig laaan noqoto waxaan kuu gudbinaynaa xarunta caafimaadka oo lagugu daawayn haddii aad ogolaato.

Dhibaatooyinka cilmibaadhista

Dhibka kaliya ah ee aad la kulmi waa xanuun kayar ee irbada markad hiiga lagaa qaadayo. Wax dhib ah oo kale oo la ogyahay major. Haddii dhib soo baxo waa laguu sheegi kabacdii mar labaad goaan waad gaadhi kartaa ood diidi kartaa innad ka qayb qaadato.

Xaq waxaad u leedahay inaad diido

Inaad ka qayb qaadato cilmibaadhistan qasab maaha, waad diidi kartaa ka qaybgalka. Xilligii aad dareento waad ka noqon kartaa ka qaybgalka cilmibaadhista adigoon wax dhib ah kusoo gaadhaynin.

Laxidhiidh

Cilmibaddhistan waxaa eegi oo ansixin gudiga cilmibaadhista ee jaamacada Gondar, haddaba haddii aad jeclaato inaad faahfaahin dheeraad ha hesho waxaad la xidhiidhi kartaa:

I. Jaamacada Gondar:
    1. Mr. Molla Mesele; Tel: 0920 25 46 64, E-mail: molmesele@gmail.com
    2. Mr. AlemayehuShemeka; Tel: 0912 13 75 86

II. Shakalca: MelakuTadege
    Tel: 0910 12 05 43
    E-mail: meltad24@gmail.com

Annex 5: Consent form (Somali version)

Adiigu oo magacydu _____, inan wauribihin inka qado oo ku sabsan 10 – 19 jirka waxa uumanay inaan qabadh dhiiga inann ooganan ayaa uubanay. Sababtu dhiiga oo inaka bareyano inad warbiixinta kaqeeb qadatini marka liin baru jawaabta isla markas ayaan in jawaabeya (insheegena).

Oogalashad qofka

Sidaa kor inkugusheenoy idad qofka warbixiin oo sin laahay iyo inuujawaaba asiiyo haddu ooayahay magic qofka.

Saxeexa Kaqaybagalaha: _____ Taariikhda: _____

Waxaan halkan ku cadaynhayaa inaan warbixinta akhriyey ama la ii akhriyey oo aan fahmay islmarkaana suaalihii aan qabay oo dhan la iiga jawaabay. Waxxan halken saxiixayga ku cadaynhayaa inna cilmibaadhistan rabitaankaga uga qayb qaatay.

Saxeexa Kaqaybagalaha: _____ Taariikhda: _____

Haddii aadan waxba qorin akhrinina: Saxiixa suul saarka

Annex 6: Questionnaire (Somali verse)

Description	**Identification**
Bilaad/dhul	Itoobiya
Deegaanka	Soomaali
Name of refugee camp	Aw Barre Somalia Refugee camp
Gobolka	
Blockka	
lambarka/lambaraqoonsi	
Magacawaydiiyaha	
MagacaKormeeraha	
Taarikhda	

10 General Information on Socio-demographic/*QodobadaDhaqandhaqaale*

Before you start answering to the questions, I would like to know a bit more about 'Your or your child'

su'aalaha		Jawaabaha	Faahfaahin
Q101	*Imisaa djirtaa?*	_____ years/*[sano]*	
Q102	*Xaaladaguur*	1) bikrad 2) laqabo/wadajooga 3) lagadhintay 4) la furay 5) Diin kale, Qor] ____	
Q103	Qoomiyada?	1) Hawuyii 2) Barbo 3) Asharaf 4) Bantu 5) diin kale, Qor _____	
Q104	Xaalada wax barasho	1) Waxna qorin waxna akhrinin 2) akhris iyo qoraal kaliya ah 3) dugsi hoose dhexe 4) dugsisare 5) kulliyadiyo wax kasareeya	
Q105	waaimisa tirade qoysku]?	_____	
Q106	Imisa mud ayaad joogat xarunta qoxotiiga?	_____ [Sano],[bishiiba	
Q107	Waax deerad oo lacag mad xeesha biisha	1) Haa 2) Maya	If 'No' skip to Q107

Q108	Iimasad heesha	___ *lacagta Itoobiya ah*	
Q109	Lacagat dheeradka xageed kaheesha	1) Shaqeyn 2) sarraafad 3) ciddale maslaxad or biic 4) hadaayad or hado 5) waxa kale, Qor_____	
Q110	Waax hoola aah malediihin qoysku?	1) Haa 2) Maya	
Q111	Hadad leedihin kebad lediihin iyo imsaa lediihi?	1) ari _____ 2) geel _____ 3) dooro, jiddu duuri, ____ 4) waxa kale, Qor] ___, __	
Q112	Raashiika liin siiyo mad iibisin am wax kale ayad kubadalatiin	1) Haa 2) Maya	If No, skip to --------
Q113	Hadad jawab kor kutalo haa dhadeey Maxad ku iibsatiin?	1) Dalaga 2) Pulses 3) saliid 4) sonkor 5) waxa kale, Qor ___	
Q114	Maxad kaganastiin	1) To obtain other/preferred food stuffs 2) To obtain cash to buy animals 3) To obtain cash for food for animals 4) Waxa kale, Qor _____	

11 **Meal frequency**

su'aalaha		Jawaabaha	Faahfaahin
Q201	Imisa jeer ayaad maalinkii wax cuntaa?	1) InKabadan saddex jeer 2) saddex jeer	

		3) labo jeer 4) Hal mar	
Q202	Imisa jeer ayaadhilib & waxyaabaha hilibkaleh cuntaa?	1) hal mar todobaadkii 2) labo jeer todobaadkii 3) inkabaddan labo jeer todobaadkii 4) hal mar bishiiba 5) in kayar halmar bishiiba	
Q203	Shaah ma cabtaa?	1) Haa 2) Maya	If 'No' skip to Q206
Q204	Goorma ayaad Shaaha cabtaa?	1) Cuntada Kahor 2) Cuntada Kadib	
Q205	Imisa jeer ayaad shah cabtaa?	1) Inkabadan labo jeer maalinti 2) hal mar maalinti 3) hal mar todobaadkii 4) inkabadan hal mar todobaakii 5) wax kayar halmar todobaakii	
Q206	Imisa jeer ayaad isticmaashaa qudaaarta sidacanbaha, Muuska, Babayga, liinta IWM?	1) hal mar todobaadkii 2) labo jeer todobaadkii 3) inkabaddan labo jeer todobaadkii 4) hal mar bishiiba 5) in kayar halmar bishiiba	
Q207	Imisa jeer ayaad isticmashaa ukunta iyo waxyaabaha leh?	1) Maalinwalba 2) hal mar/maalin todobaakiiba 3) laboo jeer todobaakiiba 4) inkabadanlabo jeer todobaakii 5) hal mar bishiiba 6) inkayar halmar bishiiba	
Q208	Imisa jeer ayaad isticmaashaa caanaha iyo cunto caano lagudaray?	1) labo jeer iyo inkabadan maalinkii 2) hal mar maalintii 3) hal mar todobaakii 4) inkayar halmar todobaakiiba	
Q209	Waa maxay cuntada qoysku sida joogtada ah u cuno?	1) bariis iyo bassto 2) masago (galay ama hadhuudh) 3) waxkale kale, Qor_____	

12 **Dietary Diversity or Food intake history**

Q.no	Food group [used by 24 recall]	Examples	Haa=1 Maya =0	Main source: 4. purchase 5. gift 6. other (specify)
Q301	Dalaga	Rootiga, canjeerad, shurbada, galayda, hadhuudh, barrisqamatiiyo wax lagasameeyey		
Q302	Khudaar	Bataatiga, baradhada, qajida, xabuubtaiwm		
Q303	Qudaarmidhalaydaah	Canbe moos, babayliin, saytuuniwm		
Q304	Kali, bari, iyowadne			
Q305	hilibka, xoolaha, iyodigga	Baruuriyojiidh …..		
Q306	Ukunta			
Q307	Malayamakaluun			
Q308	digirtalawska, atarka, misirkaiwm	Digir		
Q309	Caanaha, iyo waxa kasoobaxa	Ciir, subag, gadhood, iwm		
Q310	Saliida iyo subaga	Xaydha, subaga, gadhoodiwm		
Q311	Macmacaanka	Sonkorta, malabka, cabitaanada, macaan, shukuleetada, nacnacaiwm		`
Q312	Shaah, Bun, Maraqa, iwm			

13 **Health and physiology conditions**

su'aalaha		Jawaabaha	Faahfaahin
Q401	Caruur inka hanunsa waay jiran	1. Haa 2. Maya	If no skip to -----
Q402	Haday jirtan mad noo sheegi karta	_____	
Q403	Dawad laasiiyey mad iitusi karta misee waad ii sheegi karta	_____	
Q404	Waax shuuban oo kusoo labtaay Muu jira labadan iisbuuc?	1) *HaaI* 2) *Maya*	
Q405	Hadad jawaabta haa dhadeey Xarunta caafimadka mad aadiisey	1) Haa 2) Maya 3) waxkale kale, Qor_____	
Q406	Mad bilawadey 'menstruation?	1) Haa 2) Maya	
Q407	Hada bilawey menstruationma caadi miya mise caaadi maha?	1) Caadi 2) Caadi Maha	

14 **Hemoglobin Level and nutritional status**

Q.NO.	*goobtatijaaboiyosu'aalaha*	*Jawaabta/cabirka]*	*Faahfaahin*
Q501	Culaab/ culays(nearest 0.1 kg)		
Q502	joog, dherer (nearest 0.1 cm)		
Q503	*cabirkaDhiiga*		
Q504	BMI		
Q505	Maa ubah antay in lagu gudiibiyo arunta caatimadke?	1) *Haa* 2) *Maya*	
Q506	Mad qadatay kamika kabsolka ee Fefol ka?	1) *Haa* 2) *Maya*	
Q507	Mad qadatay kamika kabsolka ee vit A ka?	1) *Haa* 2) *Maya*	

Aakhir, Waan yara bukaa/Mahadsanid!

Annex 7: Declaration

I, the under signed senior MSc student declare that this thesis is my original work in partial fulfillment for the requirement of the master degree in applied human nutrition.

Name: MelakuTadege

Signature: _____

Place of submission: Institute of public health collage of medicine and health science, University of Gondar.

Date of submission: _____

This thesis work has been submitted for examination with my/our approval as university advisor(s).

Advisor (s)

Name	**Signature**
1. Mr. Molla Mesele(BSc, MSc)	_____
2. Mr. AlemayehuShemeka (BSc, MPH)	_____